

## **Appendices**

## Appendix 1

Table A1.1. Number (%) sizes prostheses of all patients with a SKI prosthesis (Group I) (n=341)

Size prosthesis	2	3	4	Unknown	Total
<b>Size PE</b>					
<b>7</b>	13 (3,8)	171 (50,1)	89 (26,1)		<b>273 (80,1)</b>
<b>9</b>	4 (1,2)	30 (8,8)	10 (2,9)		<b>44 (12,9)</b>
<b>11</b>	2 (0,6)	2 (0,6)	7 (2,1)		<b>11 (3,2)</b>
<b>13</b>		2 (0,6)	1 (0,3)		<b>3 (0,9)</b>
<b>Unknown</b>		1 (0,3)	2 (0,6)	7 (2,1)	<b>10 (2,9)</b>
<b>Total</b>	<b>19 (5,6)</b>	<b>206 (60,4)</b>	<b>109 (32,0)</b>	<b>7 (2,1)</b>	<b>341</b>

Table A1.3. Number (%) sizes prostheses of all patients seen at Tc (Group III) (n=97)

Size prosthesis	2	3	4	Unknown	Total
<b>Size PE</b>					
<b>7</b>	5 (5,2)	51 (52,6)	18 (18,6)		<b>74 (76,3)</b>
<b>9</b>		11 (11,3)	4 (4,1)		<b>15 (15,5)</b>
<b>11</b>	1 (1,0)		1 (1,0)		<b>2 (2,1)</b>
<b>13</b>		2 (2,1)	1 (1,0)		<b>3 (3,1)</b>
<b>Unknown</b>		1 (1,0)		2 (2,1)	<b>3 (3,1)</b>
<b>Total</b>	<b>6 (6,2)</b>	<b>65 (67,0)</b>	<b>24 (24,7)</b>	<b>2 (2,1)</b>	<b>97</b>

Table A1.5. Number (%) sizes prosthesis available for retrieval analysis (chapter 7) (n=34)

Size prosthesis	2	3	4	Total
<b>Size PE</b>				
<b>7</b>	1 (2,9)	12 (35,3)	15 (44,1)	<b>28 (82,6)</b>
<b>9</b>		3 (8,8)	1 (2,9)	<b>4 (11,8)</b>
<b>11</b>			1 (2,9)	<b>1 (2,9)</b>
<b>13</b>		1 (2,9)		<b>1 (2,9)</b>
<b>Total</b>	<b>1 (2,9)</b>	<b>16 (47,1)</b>	<b>17 (50,0)</b>	<b>34</b>

Table A1.2. Number (%) sizes prostheses of the patients seen at Tp (Group II) (n=194)

Size prosthesis	2	3	4	Unknown	Total
<b>Size PE</b>					
<b>7</b>	5 (2,6)	102 (52,6)	45 (23,2)		<b>152 (78,4)</b>
<b>9</b>	1 (0,5)	23 (11,9)	4 (2,1)	28 (14,4)	
<b>11</b>	2 (1,0)	2 (1,0)	4 (2,1)	8 (4,1)	
<b>13</b>		2 (1,0)	1 (0,5)	3 (1,5)	
<b>Unknown</b>		1 (0,5)		2 (1,0)	<b>3 (1,5)</b>
<b>Total</b>	<b>8 (4,1)</b>	<b>130 (67,0)</b>	<b>54 (27,8)</b>	<b>2 (1,0)</b>	<b>194</b>

Table A1.4. Number (%) sizes prostheses of the patients that had a PE exchange (Group IV) (n=22)

Size prosthesis	2	3	4	Unknown	Total
<b>Size PE</b>					
<b>7</b>	1 (4,5)	9 (40,9)	9 (40,9)		<b>19 (86,4)</b>
<b>9</b>		2 (9,1)			<b>2 (9,1)</b>
<b>11</b>					
<b>13</b>		1 (4,5)			<b>1 (4,5)</b>
<b>Unknown</b>					
<b>Total</b>	<b>1 (4,5)</b>	<b>12 (54,5)</b>	<b>9 (40,9)</b>		<b>22</b>

## Appendix 2

**Table A2.1.** Sex, side of operation and number of patients (%) and knees (%) in different patient Groups

	Group I		Group II		Group II-a		Group III		Group IV	
	n (%) Patients	n (%) Knees	n (%) Patients	n (%) Knees	n (%) Patients	n (%) Knees	n (%) Patients	n (%) Knees	n (%) Patients	n (%) Knees
<b>Sex</b>										
Men	61 (23.9)	80 (23.5)	28 (19.2)	34 (17.5)	17 (23.3)	19 (19.6)	13 (16.5)	15 (15.5)	4 (20.0)	4 (18.2)
Women	194 (76.1)	261 (76.5)	118 (80.8)	160 (82.5)	56 (76.7)	78 (80.4)	66 (83.5)	82 (84.5)	16 (80.0)	18 (81.8)
<b>Side</b>										
Right	179 (52.5)		102 (52.6)		56 (57.7)		46 (47.4)		12 (54.5)	
Left	162 (47.5)		92 (47.4)		41 (42.3)		51 (52.6)		10 (45.5)	

**Table A2.2.** Diagnosis and number of patients (%) and number of knees (%) in different patient Groups

Diagnosis	Group I		Group II		Group II-a		Group III		Group IV	
	n (%) P	n (%) K	n (%) P	n (%) K	n (%) P	n (%) K	n (%) P	n (%) K	n (%) P	n (%) K
Rheumatoid arthritis	135 (52.9)	201 (58.9)	64 (43.8)	98 (50.5)	32 (43.8)	41 (42.3)	34 (43.0)	34 (35.1)	7 (33.3)	8 (36.4)
Degenerative arthritis	94 (36.9)	112 (32.8)	62 (42.5)	75 (38.7)	32 (43.8)	47 (48.5)	33 (41.8)	51 (52.6)	7 (33.3)	8 (36.4)
Posttraumatic arthritis	14 (5.5)	14 (4.1)	10 (6.8)	10 (5.2)	5 (6.8)	5 (5.2)	5 (6.3)	5 (5.2)	4 (19.0)	4 (18.2)
Haemophilia	4 (1.6)	5 (1.5)	4 (2.7)	5 (2.6)	2 (2.7)	2 (2.1)	3 (3.8)	3 (3.1)	1 (4.8)	1 (4.5)
Psoriatic arthritis	3 (1.2)	4 (1.2)	2 (1.4)	2 (1.0)				2 (2.1)		
M. Gaucher	2 (0.8)	2 (0.6)	1 (0.7)	1 (0.5)	1 (1.4)	1 (1.0)				
Osteochondritis Dissecans	1 (0.4)	1 (0.3)	1 (0.7)	1 (0.5)	1 (1.4)	1 (1.0)	2 (2.5)			
Post osteomyelitis	1 (0.4)	1 (0.3)	1 (0.7)	1 (0.5)			1 (1.3)	1 (1.0)		
Aneurysmatic Bone Cyst	1 (0.4)	1 (0.3)	1 (0.7)	1 (0.5)			1 (1.3)	1 (1.0)	1 (4.8)	1 (4.5)
<b>Total</b>	<b>255</b>	<b>341</b>	<b>146</b>	<b>194</b>	<b>73</b>	<b>97</b>	<b>79</b>	<b>97</b>	<b>20</b>	<b>22</b>

P = Patients, K = Knees.

**Table A2.3.** Age at the time of surgery and at follow-up (mean  $\pm$  sd (min-max)) in different patient Groups

	Group I		Group II		Group II-a		Group III		Group IV	
	Mean $\pm$ sd (min-max)	n	Mean $\pm$ sd (min-max)	n	Mean $\pm$ sd (min-max)	n	Mean $\pm$ sd (min-max)	n	Mean $\pm$ sd (min-max)	n
<b>Age at time of surgery</b>										
Total	64.3 $\pm$ 13.2 (20-87)	255	61.5 $\pm$ 14.7 (19-86)	146	66.1 $\pm$ 12.2 (37-86)	73	56.9 $\pm$ 15.6 (19-84)	79	53.1 $\pm$ 16.0 (21-77)	20
Men	60.7 $\pm$ 13.6 (21-83)	61	54.2 $\pm$ 16.2 (21-81)	28	61.0 $\pm$ 14.9 (37-81)	17	48.2 $\pm$ 15.6 (21-72)	13	50.4 $\pm$ 20.1 (21-68)	4
Women	65.5 $\pm$ 12.9 (19-86)	194	61.6 $\pm$ 15.0 (19-86)	118	67.7 $\pm$ 10.9 (40-86)	56	58.6 $\pm$ 15.2 (19-84)	66	54.0 $\pm$ 15.3 (28-77)	16
Degenerative arthritis	70.7 $\pm$ 8.5 (43-86)	94	69.7 $\pm$ 9.2 (43-86)	62	73.1 $\pm$ 8.4 (43-86)	32	66.4 $\pm$ 8.7 (44-83)	33	60.5 $\pm$ 10.2 (44-77)	7
Rheumatoid arthritis	60.7 $\pm$ 14.2 (19-86)	135	55.2 $\pm$ 15.7 (19-84)	64	61.4 $\pm$ 12.5 (37-81)	32	48.6 $\pm$ 16.1 (19-84)	34	45.6 $\pm$ 17.5 (27-73)	7
Other	60.2 $\pm$ 14.0 (21-78)	26	56.2 $\pm$ 13.4 (21-75)	20	58.3 $\pm$ 10.2 (44-75)	9	53.9 $\pm$ 15.3 (21-74)	12	53.4 $\pm$ 18.1 (21-69)	6
<b>Age at Tp</b>										
Total			71.3 $\pm$ 14.2 (27-93)	146	75.8 $\pm$ 11.5 (50-93)	73	66.6 $\pm$ 15.0 (27-92)	79	63.2 $\pm$ 15.2 (32-83)	20
Men			66.9 $\pm$ 15.9 (32-91)	28	71.1 $\pm$ 14.2 (50-91)	17	57.3 $\pm$ 14.4 (32-78)	13	60.7 $\pm$ 19.0 (32-81)	4
Women			72.5 $\pm$ 13.5 (27-93)	118	77.3 $\pm$ 10.3 (51-93)	56	68.5 $\pm$ 14.6 (27-92)	66	63.9 $\pm$ 14.5 (39-83)	16
<b>Age at Tc</b>										
Total							70.8 $\pm$ 15.0 (32-96)	79	66.5 $\pm$ 14.9 (37-88)	20
Men							61.5 $\pm$ 14.4 (37-83)	13	59.7 $\pm$ 17.1 (37-73)	4
Women							72.6 $\pm$ 14.6 (32-96)	66	68.1 $\pm$ 14.5 (44-88)	16

**Table A2.4.** Body weight (kg) (mean  $\pm$  sd (min-max)) in different patient Groups

	Group I		Group II		Group II-a		Group III		Group IV	
	Mean $\pm$ sd (min-max)	n	Mean $\pm$ sd (min-max)	n	Mean $\pm$ sd (min-max)	n	Mean $\pm$ sd (min-max)	n	Mean $\pm$ sd (min-max)	n
<b>Body weight (kg)</b>										
Total	71.2 $\pm$ 11.9 (36-102)	245	71.7 $\pm$ 12.5 (46-102)	146	73.2 $\pm$ 13.2 (47-102)	73	70.6 $\pm$ 12.2 (46-102)	79	72.8 $\pm$ 11.1 (46-85)	20
Men	78.1 $\pm$ 9.4 (59-102)	57	81.1 $\pm$ 10.1 (59-102)	28	81.3 $\pm$ 11.4 (59-102)	17	78.9 $\pm$ 9.1 (64-92)	13	75.6 $\pm$ 7.4 (64-83)	4
Women	69.1 $\pm$ 11.9 (36-102)	188	69.5 $\pm$ 12.0 (46-102)	118	70.8 $\pm$ 12.8 (47-102)	56	68.9 $\pm$ 12.1 (46-102)	66	71.9 $\pm$ 12.0 (46-85)	16
Degenerative arthritis	75.1 $\pm$ 11.0 (47-102)	89	76.3 $\pm$ 10.4 (47-102)	62	76.3 $\pm$ 12.5 (47-102)	32	77.3 $\pm$ 9.0 (55-102)	33	80.1 $\pm$ 3.8 (74-85)	7
Rheumatoid arthritis	67.9 $\pm$ 12.2 (36-100)	130	66.6 $\pm$ 13.4 (46-100)	64	69.9 $\pm$ 14.3 (49-100)	32	63.0 $\pm$ 11.7 (46-90)	34	62.3 $\pm$ 11.7 (46-81)	7
Other	74.2 $\pm$ 9.3 (57-90)	26	73.6 $\pm$ 9.3 (57-86)	20	73.8 $\pm$ 9.8 (58-86)	9	73.8 $\pm$ 8.9 (57-86)	12	77.0 $\pm$ 4.8 (73-83)	6

**Table A2.5.** Number (%) of different procedures performed before total knee replacement and number of procedures performed in each knee in different patient Groups

	<b>Group I (n=341)</b>		<b>Group II (n=194)</b>		<b>Group II-a (n=97)</b>		<b>Group III (n=97)</b>		<b>Group IV (n=22)</b>	
	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>
<b>Procedures before total knee replacement</b>										
Arthroscopy	29	(8.5)	22	(11.3)	10	(10.3)	12	(12.4)	5	(21.7)
Synovectomy	25	(7.3)	20	(10.3)	4	(4.1)	16	(16.5)	4	(17.4)
Meniscectomy (arthrotomy)	23	(6.7)	18	(9.3)	9	(9.3)	9	(9.3)	4	(17.4)
Correction osteotomy	11	(3.2)	8	(4.1)	5	(5.2)	3	(3.1)	1	(4.3)
Excision of corpora libera (arthrotomy)	6	(1.8)	3	(1.5)	1	(1.0)	2	(2.1)		
Meniscectomy (arthroscopy)	4	(1.2)	3	(1.5)	1	(1.0)	2	(2.1)		
Drilling of cartilage	4	(1.2)	3	(1.5)			3	(3.1)	1	(4.3)
Patellar realignment	2	(0.6)	2	(1.0)			2	(2.1)		
Excision of Bakers cyst	2	(0.6)	1	(0.5)			1	(1.0)	1	(4.3)
Capsulotomy because of extension deficit	2	(0.6)	2	(1.0)	2	(2.1)				
Adhaesiolysis	1	(0.3)	1	(0.5)			1	(1.0)		
Biopsy	1	(0.3)	1	(0.5)			1	(1.0)	1	(4.3)
External fixaton after non-union corr. ost.	1	(0.3)								
ORIF tibial plateau fracture	1	(0.3)	1	(0.5)	1	(1.0)				
Removal hardware after osteosynthesis	1	(0.3)	1	(0.5)	1	(1.0)				
Suture of ligaments	1	(0.3)	1	(0.5)			1	(1.0)	1	(4.3)
Aneurysmatic Bone Cyst	1	(0.3)	1	(0.5)			1	(1.0)	1	(4.3)
Unknown	1	(0.3)	1	(0.5)			1	(1.0)		
<b>Total</b>	<b>116</b>	<b>(34.0)</b>	<b>89</b>	<b>(45.9)</b>	<b>34</b>	<b>(35.1)</b>	<b>55</b>	<b>(56.7)</b>	<b>19</b>	<b>(82.6)</b>
	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>	<b>n</b>	<b>(%)</b>
<b>Number of procedures</b>										
0	262	(76.8)	137	(70.6)	76	(78.4)	61	(62.9)	9	(40.9)
1	62	(18.2)	44	(22.7)	16	(16.5)	28	(28.9)	10	(45.5)
2	7	(2.1)	4	(2.1)			4	(4.1)	2	(9.1)
3	5	(1.5)	4	(2.1)	3	(3.1)	1	(1.0)		
4	2	(0.6)	2	(1.0)	1	(1.0)	1	(1.0)		
5	2	(0.6)	2	(1.0)	1	(1.0)	1	(1.0)	1	(4.5)
7	1	(0.3)	1	(0.5)			1	(1.0)		



**Table A2.7.** Patient characteristics of the patients included in the radiographic and retrieval analysis (Chapter 5, 6 and 7)

	Presence of wear and wear rate (Section 5.5)		Wear and alignment of the prosthesis / leg (Section 5.6 & 5.7)		Analysis of radiolucency (Chapter 6)		Retrieval analysis (Chapter 7)	
	n (%) Patients	n (%) Knees	n (%) Patients	n (%) Knees	n (%) Patients	n (%) Knees	n (%) Patients	n (%) Knees
Total	58	71	47	54	68	85	31	34
Male	11 (19.0)	14 (19.7)	8 (17.0)	11 (20.4)	11 (16.2)	14 (16.5)	9 (29.0)	10 (29.4)
Female	47 (81.0)	57 (80.3)	39 (83.0)	43 (79.6)	57 (83.8)	71 (83.5)	22 (71.0)	24 (70.6)
<b>Diagnosis</b>								
Rheumatoid arthritis	24 (41.4)	35 (49.3)	21 (44.7)	27 (50.0)	31 (45.6)	46 (54.1)	13 (41.9)	15 (44.1)
Degenerative arthritis	25 (43.1)	26 (36.6)	19 (40.4)	19 (35.2)	28 (41.2)	29 (34.1)	10 (32.3)	11 (32.4)
Posttraumatic arthritis	4 (6.9)	4 (5.6)	2 (4.3)	2 (3.7)	4 (5.9)	4 (4.7)	4 (12.9)	4 (11.8)
Haemophilia	2 (3.4)	3 (4.2)	2 (4.3)	3 (5.6)	2 (2.9)	3 (3.5)	3 (9.7)	3 (8.8)
Psoriatic arthritis	2 (3.4)	2 (2.8)	2 (4.3)	2 (3.7)	2 (2.9)	2 (2.4)	1 (3.2)	1 (2.9)
Post osteomyelitis	1 (1.7)	1 (1.4)	1 (2.1)	1 (1.9)	1 (1.5)	1 (1.2)		
Age at time of surgery (years) mean ± sd (min-max)	56.5 ± 14.7 (24-84)		58.3 ± 14.3 (24-84)		55.3 ± 15.6 (22-84)		53.8 ± 14.5 (21-77)	
Time of follow-up mean ± sd (min-max)	14.0 ± 2.5 (10.0-19.1)		14.0 ± 2.6 (10.0-19.1)		Tp: 9.9 ± 2.6 (6.1-15.5) Tc: 14.0 ± 2.6 (10.0-19.1)		12.1 ± 3.0 (6.2-17.9)	
Body weight mean ± sd (min-max)	72.0 ± 13.0 (46-102)		71.0 ± 13.5 (46-102)		70.9 ± 13.2 (46-102)		73.9 ± 11.1 (46-102)	

### Appendix 3. American Knee Society Score

Patient category	
A. Unilateral or bilateral (opposite knee successfully replaced)	
B. Unilateral, other knee symptomatic	
C. Multiple arthritis or medical infirmity	
Knee Score	Function Score
<b>Pain:</b> None 50 Mild or occasional 45 Stairs only 40 Walking & stairs 30 Moderate 20 Occasional 10 Continual 10 Severe 0	<b>Function</b> Walking: Unlimited 50 >10 blocks 40 5-10 blocks 30 < 5 blocks 20 Housebound 10 Unable 0
<b>Range of motion</b> (5° = 1 point) 25	<b>Stairs:</b> Normal up & down 50 Normal up; down with rail 40 Up & down with rail 30 Up with rail; unable down 15 Unable 0
<b>Stability</b> (maximum movement in any position)	
<b>Anteroposterior</b> < 5 mm 10 5-10 mm 5 > 10 mm 0	
<b>Mediolateral</b> < 5° 15 6°-9° 10 10°-14° 5 15° 0	<b>Subtotal:</b> (max. 100 points)
<b>Deductions (minus)</b>	<b>Deductions (minus)</b> Cane 5 Two canes 10 Crutches or walker 20
<b>Flexion contracture</b> 5°-10° 2 10°-15° 5 16°-20° 10 >20° 15	<b>Total Function Score:</b> (max. 100 points)
<b>Extension lag</b> <10° 5 10°-20° 10 >20° 15	
<b>Alignment</b> 5°-10° 0 0°-4° 3 points each degree 11°-15° 3 points each degree Other 20	
<b>Total Knee Score:</b> (max. 100 points)	



#### Appendix 4

**Table A4.1.** Multilevel logistic regression analysis. Logistic Regression Coefficient (B) and standard error (se) of the relation between delayed wound healing, deep infection, manipulation of the knee, screw loosening, wear and aseptic loosening of the prosthesis and the factors that may increase the risk of delayed wound healing, deep infection, manipulation, screw loosening, wear and aseptic loosening (Chapter 3).

	Delayed wound healing		Deep infection		Manipulation	
	B	se	B	se	B	se
<b>Patient factors</b>						
Diagnosis						
Degenerative arthritis	0.379	0.877	1.838	0.996	<b>-1.820</b>	<b>0.576*</b>
Rheumatoid arthritis	1.045	1.109			0.333	0.645
Other	0.199	0.724	1.237	1.062	1.015	0.627
Gender	0.338	1.105	-1.176	1.509		
Diabetes Mellitus			0.562	1.057		
Obesity (BMI > 30)	-0.423	1.115	1.245	1.109		
Use of steroids			<b>2.865</b>	<b>1.127*</b>		
Ulcerations in history			1.385	1.874		
Other risk factors	1.179	1.186	<b>3.848</b>	<b>1.057*</b>		
Delayed wound healing					-0.005	0.018
Body-weight						
<b>Knee factors</b>						
Age at time of surgery	-0.027	0.022	0.023	0.028	-0.027	0.017
Previous surgery	-0.304	0.850	1.561	0.881	-0.172	0.571
Flexion preoperatively					0.008	0.011
Extension preoperatively					<b>-0.060</b>	<b>0.019*</b>
<b>Patient factors</b>						
Diagnosis						
Degenerative arthritis	-0.054	0.638	-0.853	0.710	0.264	1.230
Rheumatoid arthritis	0.041	0.707	-0.226	0.752	1.135	1.051
Other	0.155	0.617	0.256	0.658	0.086	1.057
Gender	0.039	0.021	0.040	0.023	0.027	0.044
Body-weight			<b>0.027</b>	<b>0.009*</b>	<b>0.033</b>	<b>0.017*</b>
Function Score						
<b>Knee factors</b>						
Age at time of surgery	-0.009	0.020	<b>-0.05</b>	<b>0.021*</b>	-0.01	0.033
Previous surgery	0.238	0.499	0.304	0.525	-0.145	0.809
Flexion preoperatively						
Extension preoperatively						
PE thickness	0.151	0.140	0.141	0.157	-0.226	0.229
Screw loosening			<b>2.394</b>	<b>0.582*</b>	1.375	0.805
Wear					<b>2.898</b>	<b>1.196*</b>
Time of follow-up	0.061	0.077	0.021	0.079		

\*  $p < 0.05$

## Appendix 5

In the analysis of the alignment of the leg and the prosthesis and the wear rate we assumed finding a low wear rate at an optimal alignment of the leg or the prosthesis and an increase in wear rate in a more valgus or varus position, or if the prosthesis was placed in more flexion or extension. This relation can be described in the formula:

$$\text{Wear rate} = C + B1 \times (\text{Measured Angle}^*) + B2 \times (\text{Measured Angle}^*)^2$$

C = Constant

B1 = Unstandardized Coefficient Measured Angle

B2 = Unstandardized Coefficient Measured Angle

\*Measured Angle = FTA, WBR, angle  $\alpha$ ,  $\beta$ ,  $\gamma$  or  $\sigma$

The values of B1, B2 and the p-values of the non-linear regression analysis to study the influence of the FTA, WBR and angle  $\alpha$ ,  $\beta$ ,  $\gamma$  and  $\sigma$  on the wear rate are listed in Table A 5.1.

**Table A5.1.** Values of C, B1, B2 and p-values of the non-linear regression analysis to study the influence of the alignment of the limb and the alignment of the prosthesis on the wear rate.

	C	B1	p-value	B2	p-value
Angle $\alpha$	-29,203	0,596	0,560	-0,003	0,563
Angle $\beta$	-41,333	1,015	0,304	-0,006	0,305
Angle $\gamma$	0,129	0,007	0,521	0,002	0,092
Angle $\sigma$	32,308	-0,731	0,105	0,004	0,113
FTA	17,685	-0,210	0,659	0,001	0,648
WBR	0,309	-0,240	0,753	0,133	0,841